4 System Software Configuration

4.1 FreeBSD

As with the evolution of microcomputers, UNIX has evolved also. It was originally developed as a multitasking system for minicomputers and mainframes in the mid-1970's, but has since grown to become one of the most widely used operating systems anywhere.

A system as in Figure 2, equipped with appropriate software can support the computing needs of a substantial population of users, fulfilling a similar role to the centralized multi-user mainframe and minicomputer systems that preceded the distributed system.

A distributed UNIX system supports a multi-user environment and incorporates interprocess communication facilities. Combined, these facilities were extended and exploited as a basis for the development of full distributed systems, and the necessary components for systems that follow the structure illustrated in Figure 2 were constructed.

The definition of DAISy includes the word inexpensive. Since both Linux and FreeBSD are complete free versions of UNIX which supports multi-user and interprocess communication on personal computers, that are derived from the 80x86 architecture, the only decision was to decide on which operating system to use. Linux 1.1.59 was the original OS for DAISy, but the NFS performance used for user file systems was the eventual downfall. FreeBSD 2.1.*x* is the current OS and the NFS performance has proven to be efficient. The operating system in freely redistributable FreeBSD [17] , a BSD 4.4Lite-derived UNIX OS.

4.2 Message Passing Software

In order to consider **DAISy** as a parallel processing system both hardware and software configurations must be able to support such an architecture. We have seen how a networked cluster of UNIX workstations is the backbone for such a system, but, the parallel architecture also requires API (Application Program Interface) tools to allow users accessible means of parallel programming. We have already seen that both PVM [12] and MPI [8] contain such standardized message passing libraries.

4.3 Directory Hierarchy

The directory hierarchy of the DAISy cluster is like all UNIX workstations, as shown if Figure 13, with each node possessing the general UNIX directory hierarchy of a single UNIX workstation. The difference is in the users directory (/u/daisy/people) as shown. The users directory is NFS (network file system) mounted on all DAISy nodes except d-00 where it actually resides. The use of the automount daemon (amd) allows for users to automount home directories on their personal workstations. This allows users to recycle existing files on their personal systems.

In order to insure that all operating systems and passwords on all nodes are identical the *rdist* tool is used. *rdist* is a tool used to distribute selected files to various nodes on a network.

Another important aspect in cluster computing is time/date. For d-01 through d-15 the timed is synched to d-00. d-00 is then synched to an external reliable system.

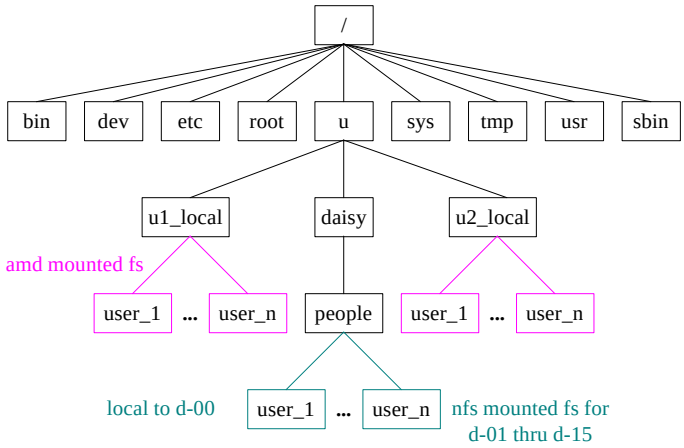

Figure 13. DAISy directory hierarchy